GENERAL NOTES.

BOTANY.[1]

RELATION OF ELEVATION TO CHANGE OF COLOR IN FLOWERS.—Having seen many speculations on elevation as occasioning a change in the color of flowers, and *Gilia aggregata* having been mentioned as an example, I will state that I found, this summer, at the border of Idaho and Oregon, lat. 47°, on Coplen's butte, a hill of considerable elevation, large numbers of specimens growing near each other, varying from almost scarlet to a nearly clear white. They seemed equally vigorous, and were so intermingled that no difference of slope or elevation would account for the variation. Near Hood river, Oregon, at a much lower elevation, I found only specimens of a deep pink, approaching crimson.—*Jos. W. Marsh, Forest Grove, Oregon.*

INSECT-DESTROYING FUNGI.—Every one has doubtless often seen in the autumn and early winter, dead flies adhering to the ceiling and various objects in the room, and which, upon close inspection, are seen to be swollen, with the abdomen covered with a white powdery substance. Dissection of fresh specimens of such flies reveals a great number of short, colorless, branching nonseptate hyphæ, whose granular protoplasm contains numerous oil globules. These hyphæ are the vegetative organs of a parasitic plant to which the name *Empusa muscæ* is frequently given, and under this name it may be found briefly described in many books on fungi. It is now, however, pretty well established that we have here again another instance of a very common mistake in cryptogamic botany, that is, a description and classification based upon a knowledge of only one stage of the plant. Cohn ten years ago suspected this to be the case, but it remained for Brefeld and Nowakowski to demonstrate it, which they did in 1877. The latest contribution to our knowledge of the group of plants to which the fly fungus is now referred, is by Giard (Deux espèces d'Entomophthora nouvelles pour la Flora Française) in the Bulletin Scientifique du Département du Nord.

The results of these several investigations are that the old genera Empusa and Tarichium are now to be considered as respectively, the asexual and sexual stages of low forms of the order Saprolegniaceæ, and Giard proposes that the two old names be retained to designate the stages, and that the much more applicable name Entomophthora, proposed by Fresenius, be used to designate the genus. The fly fungus will accordingly be known as *Entomophthora muscæ* Fres.

The life-history of the Entomophthoræ may be briefly summarized as follows:

1. *Empusa stage.*—The short colorless branching hyphæ ramify through the tissues of the host, their swollen extremities eventu-

[1] Edited by PROF. C. E. BESSEY, Ames, Iowa.

ally coming to the exterior surface, where by constriction each gives rise to one or more spheroidal conidia. These conidia constitute the white powdery substance spoken of above. Conidia have been observed to germinate in water, sending out long thick hyphæ. Doubtless they serve in some way to quickly communicate the parasite from host to host, but the particular manner of their doing this has not yet been made out.

2. *Tarichium stage.*—In the same host which sustained the Empusa stage, or possibly in another, the hyphæ develop the sexual organs. These are similar to those found in other Saprolegniaceæ, and give rise to oöspores, which have thick and sometimes reticulated walls. The hyphæ and ripe oöspores occupy the cavity of the body of the host as a pulverulent mass. The oöspores (the hypnospores of Cohn) are disseminated by the decay of the body of the host, and after a period of rest reproduce the parasite again.

There are doubtless many species of Entomophthora in the United States, but so far as the writer is aware they have been but little studied.

Giard describes a species *(E. calliphoræ)* which is found in France parasitic upon *Musca (Calliphora) vomitoria;* and as this host is one of our common meat flies it is altogether likely that its enemy is to be found here also. The fungus long ago described by Leidy (although not named by him) as occurring in the abdomen of the seventeen-year Cicada, appears from his figures to be a species of this genus. Peck, in the Thirty-first Report of the N. Y. State Museum of Natural History, describes what is probably the Tarichium stage of the same parasite under the new genus Massospora, and says, "it apparently belongs to the Coniomycetes." The species he names *M. cicadina.* Probably the "muscardine" of the silk-worm (the so-called *Botrytis bassiana)* will be found to belong here also.

Bennett's Classification of the Cryptogams.—In the recent meeting of the British Association for the Advancement of Science, A. W. Bennett proposed a considerable modification of the classification given by Sachs in the fourth edition of the "Lehrbuch." The following sketch will convey to the student who is familiar with Sachs' work, a good idea of the proposed classification.

I. THALLOPHYTA.

Class I. Protophyta.

Sub-class Protomycetes.

Order *Schizomycetes.*

Under this order Saccharomyces is regarded as an aberrant form.

Sub-class Protophyceæ.

Orders, *Protococcaceæ, Nostocaceæ, Oscillatorieæ, Rivularieæ.*

Myxomycetes, a low group supplementary to the Protophyta, not exhibiting true sexual conjugation.

CLASS II. FUNGI.

Sub-class Zygomycetes.

Order *Mucorini.*

Sub-class Oömycetes.

Orders *Peronosporeæ* and *Saprolegniaceæ.*

Sub-class Carpomycetes.

Orders, *Uredineæ, Ustilagineæ, Basidiomycetes* and *Ascomycetes* (the last including the Sub-order *Lichenes*).

CLASS III. ALGÆ.

Sub-class, Zygophyceæ.

Orders *Pandorineæ, Hydrodictyeæ, Confervaceæ, Ulotrichaceæ, Ulvaceæ, Botrydieæ,* and *Conjugatæ* (the last including the Sub-orders *Desmidieæ, Diatomaceæ, Zygnemaceæ* and *Mesocarpeæ*).

Sub-class Oöphyceæ.

Orders *Volvocineæ, Siphoneæ, Sphæropleaceæ, Œdogoniaceæ, Fucaceæ* and *Phæosporeæ.*

Sub-class Carpophyceæ.

Orders *Coleochæteæ* and *Floridеæ.*

II. CHARACEÆ.

No change is proposed in this group other than separating it as one of the primary divisions of the vegetable kingdom.

III. MUSCINEÆ.

No change is proposed in this division.

IV. VASCULAR CRYPTOGAMS.

Isosporia.

Orders *Filices* (including *Ophioglossaceæ*) *Lycopodiaceæ* and *Equisetaceæ.*

Heterosporia.

Orders *Rhizocarpeæ* and *Selaginellaceæ.*

BOTANICAL NOTES.—Planchon reports the advent of the American grape mildew *(Peronospora viticola)* in the vineyards of France, and Pirotta reports its presence in the Italian vineyards in the Appennines.——Thomas Meehan has prepared a valuable paper on forests and forestry for the forthcoming Report of the State Board of Agriculture of Pennsylvania, the advance sheets of which have been received. After a careful personal examination of the forests of portions of Pennsylvania, Virginia, North Carolina and Tennessee, he concludes "that there is much more timber in the country than people generally believe, though at present in localities not convenient, as a general thing, to market at paying prices." He notes the great rapidity of growth in the trees of the region examined, as contrasted with their slow growth in Europe, and maintains that with proper care and culture, good paying timber can be grown in from fifteen to twenty years.——In the *Journal of Botany* for November, Henry Trimen has an interesting article "On the plant affording Ceará India rubber." It is a Brazilian tree *(Manihot glaziovii)* now grown in Ceylon, and it promises to become a valuable rubber-producing tree.——In the October *Bulletin* of the Torrey Botanical Club, Mr. Le Roy reports a remarkable case of duration of vitality of the seeds of an undetermined Cucurbit from Patagonia. Seeds from a specimen collected by the Wilkes Exploring Expedition between 1838

and 1842, were planted and successfully germinated the past summer.—In the same journal W. R. Gerard begins a "List of the State and local floras of the United States;" it gives the name, date and place of publication of all the important catalogues of plants ever published in this country. As such a list will be very useful to botanists, all who can should contribute to its completeness by communicating with the author, at 9 Waverly Place, New York city.——Botanists will be glad to learn that the publication of Dr. T. F. Allen's promising work, "Characeæ Americanæ" has been resumed. The parts now contain three plates each.——"A manual of the mosses of the United States" is said to be in course of preparation by Thos. P. James and Leo Lesquereux. The authors hope to publish it sometime during 1881.——Dr. Uhlworm's "Botanisches Centralblatt," which covers much the same ground as the well known "Botanischer Jahresbericht," by Dr. Just, promises to be more valuable than the latter in one respect at least, and that is in the greater promptness of its publication. Anderson, Farlow, Harvey, Lesquereux, Parry and Rothrock are the American contributors.——The papers in the last number of Pringsheim's *Jahrbücher für wissenschaftliche Botanik* are one by Bretfeld upon the healing of wounds, and the separation of the leaf from the twig; one by Müller upon the glands of the Cruciferæ; one by Tangl upon the open passages between the cells in the endosperm of certain seeds *(e. g., Strychnos nux-vomica, Areca oleracea* and *Phœnix dactylifera);* and one by Bachman upon the corky outgrowths upon leaves. ——The October number of the *Quarterly Journal of Microscopical Science* contains two botanical articles, viz: Bennett on the classification of Cryptogams, and Bennett and Murray on a reformed system of terminology of the reproductive organs of Cryptogamia. The latter will be more fully noticed hereafter. ——Thomas Meehan has been studying the question of the cause of the timber line upon high mountains (Proc. A. N. S. of Philadelphia, Sept., 1880). On Gray's peak the coniferous trees near the line of 11,000 feet are thirty to forty feet high, but at this line they cease as suddenly "as if a wood had been cut half away by a woodman's axe." Beyond the timber line the same species exist as dwarf, stunted trailing shrubs, often extending fifteen hundred feet higher up the mountain side. These stunted plants appear never to produce seed! Mr. Meehan's studies in the mountains of North Carolina and in the White mountains of New Hampshire, lead him to the conclusion that the stunted plants are the struggling offspring of trees which at no very remote period extended much further up the mountain than they do now. The reason for the disappearance of the large trees he believes to be due mostly to the disintegration of the rocks and the washing down of the earth from the higher elevations, thus starving the larger vegetation, while still affording conditions permitting the growth of smaller plants.